Remarks

Claims 1-8 and 10-14 are pending. Claims 1-8 and 10-14 are rejected. All rejections are respectfully traversed. Claim 15 is new and does include any new subject matter.

1. **Claims 2, 3, 10, 11, and 12** are objected to because of the following informalities:

Informalities in the claims have been corrected.

3. **Claim 12** is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Consider claim 12, the text in line 14, "and each packet in the network using the DSR", is ambiguous because it is not clear as to what is being claimed. Appropriate clarification is requested.

Dynamic source routing (DSR) at line 14 is introduced on lines 4-5 of the claim. DSR is a well known term or art in the field of ad-hoc networks, and is fully defined in the following paragraphs of the specification:

[012] *In the prior art*, two techniques have been used to address the above problems: *dynamic source routing* (DSR), and ad-hoc on-demand distance vector routing (AODV). [013] DSR is 'on-demand'. DSR allows a source node to discover dynamically a route, via multiple network links, to any destination node in the ad-hoc network. DSR is also 'loop-free' because each packet includes a complete, ordered list of addresses of nodes that form the route. [014] DSR operates in two modes: route discovery, and route

maintenance. During route discovery, the source node discovers and determines an ordered list of nodes through which packets must pass while traveling to the destination node. This ordered list is appended to each packet that is transmitted in the network. In that way, an intermediate node merely forwards a received packet to the next node in the ordered list. Thus, intermediate nodes do not need to discover and maintain routing information for all nodes in the network. However, the intermediate node can store the routing information contained in forwarded packets in a memory for future use.

Also see, **Dynamic Source Routing:** From Wikipedia, the free encyclopedia

"Dynamic Source Routing (DSR) is a routing protocol for wireless mesh networks. It is similar to AODV in that it forms a route on-demand when a transmitting computer requests one. However, it uses source routing instead of relying on the routing table at each intermediate device. Many successive refinements have been made to DSR, including DSRFLOW."

There is requirement in the M.P.E.P. that well known prior art needs to be described in detail in the specification.

5. **Claims 1-8 and 10-14** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Stanforth et al.** (U.S. Patent # 7,151,769 B2) in view of **Broch et al.** (Non-Patent Publication <draft-ietf-manet-dsr-00.txt>).

As stated previously, in an amendment filed on October 22, 20007, and incorporated herein by reference Stanfod only describes an Ad hoc On Demand Distance Vector (AODV) routing. AODV constructs routes only as needed. The routes are stored in the memory of each node for later use. This consumes memory resources and power, particularly if there are a large number of routes and the routes have a large number of intermediate nodes. The stored routing table is updated only when the battery status changes,

which can make the route information rapidly out-of-date, particularly because the network is ad hoc, where nodes can enter and leave the network at any time.

The claimed packet routing uses dynamic source routing (DSR). DSR has the following advantages. First, the DSR is 'loop-free' because each packet includes a complete, ordered list of addresses of nodes that form the route. Being loop-free means packets cannot circle endlessly in a loop. Second, because the routing information carried in each packet, the routing information does not need be stored in the memory of the nodes. This greatly reduced the memory requirements at each of the nodes. Third, the routing information is always current because each packet updates the routing table in the packet as the packet is forwarded along the route.

Therefore, Stanford cannot describe "discovering a plurality of routes from a destination node to a source node via intermediate nodes of the network using dynamic source routing (DSR).

Stanford does not describe DSR routing. Stanford does not describe routing tables stored in packets as each packet is transmitted and an amount of power in each node along the route. Sanford does not describe updating the routing table in each packet each time the packet is transmitted as the packet is forwarded along the route. Stanford does not describe including the least delay cost in each packet. Stanford does not describe including a time stamp indicating a time that the particular route was discovered in each packet. Stanford does not describe ad-hoc on-demand distance vector routing that stores the routing in each packet.

Neither Standford nor Broch alone or in combination describe a routing table that is stored in a transmitted packet that stores nodes, and the amount of power in each node. Therefore, Standford and Boch in combination can make what is claimed obvious.

Furthermore, DSR and AODV routing are incompatible with each other. A network cannot use a combination of DSR and AODV routing techniques, hence Standford and Broch cannot be combined.

With respect to claim 2, claimed is determining a delay cost associated with each route; and selecting a particular route having a least delay cost; and including the least delay cost in each transmitted packet.

The Examiner states that Stanford, as modified by Broch discloses including the delay cost in each packet. With all due respect this is incorrect. Broch does not describe delays or latencies. Neither does Stanford, see column 6:

> The two major attributes of QoS are: The potential for delay, or latency, and the potential for bit errors (BER) during transmission.

Stanford merely says that *latency is an attribute of QoS.* Applicants do not claim attributes of QoS. Instead, claimed is storing "a delay cost" in a transmitted packet. As stated above Standford does not store delay cost anywhere, and neither does Boch.

Column 10 does not help either:

> links. The algorithm of the present invention modifies the algorithm described in the above-mentioned U.S. Pat. No. 6,807,165, and determines the chosen optimal routing path based on packet content—class-of-service (CoS).

This only describes packet content and CoS, not delay, and

> the same for voice, video and data transmissions, because of the above-described differing constraints among them. The routing information collected by the radio terminal source includes the number of nodes that make up each potential routing path, as well as the link-level interference and noise between each node, and the congestion level of each intermediate node. The noise level is the primary determinant of BER due to the interference, although congested nodes may also impact data errors if they are so overloaded as to cause failure of packet-delivery. The number of hops required is also a primary determinant in determining latency, along with congestion. Each additional hop of a path increases the

and

> failure of packet-delivery. The number of hops required is also a primary determinant in determining latency, along with congestion. Each additional hop of a path increases the latency by a minimum of the processing delay to relay the packet, which is typically 5 millisec. Congestion levels of a node also increases latency. The algorithm of the present invention, in addition to considering, also takes into consideration the class-of-service, whereby the chosen optimal routing path for a call is based on latency and bit error rate.

This describes the effect of delay on the number of hops and congestion level. There is nothing in any of the above paragraphs that describe storing the delay costs in transmitted packets, as claimed.

With respect to claim 3, claimed is associating a time of discovery with each route; and selecting the particular route having a most recent time of discovery; and including a time stamp indicating the time that the particular route was discovered in the routing table in each transmitted packet.

Boch describes a route cache:

"4.3.1. Route Cache

All routing information needed by a node participating in an ad hoc network is stored in a Route Cache. Each node in the network maintains its own Route Cache. ... The Route Cache SHOULD time-stamp each route as it is inserted into the cache. ... A Route Discovery for a given target node MUST NOT be initiated unless the difference between

```
the current time and the time that a Route Discovery was last initiated
for destination D is greater than the backoff interval currently listed
in the Node Information Cache for node D."
```

Broch does not describe the time of route discovery in transmitted packets. He only stores the time in the route cache. This is not what is claimed.

With respect to claim 8, claimed is 8. (original) The method of claim 6, in which an initial power of an n^{th} node is E joules, and the residual power in the n^{th} node at time t is $R(t)$ joules, and the power cost for using n^{th} node as an intermediate node is $P(n)$, and the power level $L(t)$ of the n^{th} is determined by

if $R(t) \leq E * \alpha$, then $L(t) = 3$;

else if $E * \alpha < R(t) \leq E * \beta$, then $L(t) = 2$;

else if $E * \beta < R(t) \leq E * \gamma$, then $L(t) = 1$;

else $L(t) = 0$.

where α, β, and γ are numbers less than 1.0 and monotonically increasing according to $\alpha < \beta < \gamma$.

The Examiner cites columns 8-9:

```
/*This algorithm is used by a hand-held terminal to define the battery
status and will report to other terminals in the routing data exchange:
*/
IF power_source = external
    THEN      Battery := infinite
    ELSE IF battery_level = full
        THEN Battery := excellent
        ELSE IF battery_level >= config_param_battery
            THEN Battery := poor
            ELSE Battery := critical
/* config_param_battery is a system parameter that is provisioned
over the air or the terminal interface that defines the threshold for
eliminating the terminal from the routing options. This should range
from 25% to 50% of the available battery power.
*/
```

and

As previously mentioned, there are several schemes that can be employed by the source of a message to determine the optimal route to the destination. The following algorithm is based on a minimum energy routing algorithm.

```
source-routing (message_ptr,msg_length,destination,
  msg-type)
/* source based routing including link adaptation algo-
  rithm
*/
opt_route(destination, msg_type)
/* determine optimal route to destination this will return
  the best available route based on Class-of-service
  (COS) from msg_type and other network parameters
  including link quality and battery life. The returned
  information will be used to calculate the data rate and
  power level
*/
calc_symbol_rate (sym_rate)
calc_code_rate (code_rate)
calc_pwr_level (pwr_level)
send_msg(RTS,msg_length,destination,sym_rate,code_
  rate,pwr_level)
/* send RTS to first router and await CTS to send the data
  packet
```

The Symbol Rate is a standard calculation of the number of RF chips to be used to define a symbol or bit of data in the transmission.

The Code Rate is conventional, and is a function of the direct sequence spread spectrum, and, specifically, the spreading code PN to be used for the transmission.

Power Level is defined in 1 dB steps between −27 and +28 dBm, where 28 dBm is approximately equivalent to the maximum power allowed under FCC Rules for the ISN band; for other RF spectrums, the range may vary.

opt_route (destination, msg_type)

RTS refers to Request-To-Send message; CTS refers to Clear-To-Send message; msg refers to the message sent from each terminal. The "code" is one of the four 2-digit codes of the battery status described above.

With all due respect, not a single element in claim 8 is described by Stanford, see paragraphs above.

With respect to claim 10, claimed is using an ad-hoc on-demand distance vector routing. The Examiner cites the first 13 lines of Broch at page 18.

The pages in Broch are ambiguously numbered. The first 13 lines of both page 18's are produced. Neither describes ad-hoc on-demand distance vector routing as claimed.

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```
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|  Option Type  | Option Length |         Identification        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                            Address[1]                         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

   Option Type

      ???.  A node that does not understand this option should ignore
      the option and continue processing the packet (the top two bits
      must be 00).

   Option Length

      8-bit unsigned integer.  Length of the option, in octets,
      excluding the Option Type and Option Length fields.
```

and

```
Broch, Johnson, and Maltz      Expires 13 September 1998      [Page 18]

INTERNET-DRAFT     The Dynamic Source Routing Protocol     13 March 1998

6. Detailed Operation

6.1. Route Discovery

   Route Discovery is the demand-driven process by which nodes actively
   obtain source routes to destinations to which they are actively
   attempting to send packets.  The destination node for which a Route
   Discovery is initiated to discover a route is known as the "target"
   of the Route Discovery.  A Route Discovery for a destination SHOULD
   NOT be initiated unless the initiating node has an unexpired packet
   to be delivered to that destination.

   A Route Discovery for a given target node MUST NOT be initiated
   unless the difference between the current time and the time that a
   Route Discovery was last initiated for destination D is greater than
   the backoff interval currently listed in the Node Information Cache
   for node D. After each Route Discovery attempt, the interval between
   successive Route Discoverys must be doubled, up to a maximum of
   MAX_RTDISCOV_INTERVAL.
```

With respect to claims 11-12, see above.

With respect to claim 13, as discussed above, Standford only discusses these limitations wit respect to QoS and CoS. Stanford, modified by Broch, does

not store these items anywhere, certainly not in transmitted packets, and neither does Broch.

10. **Claims 3 and 9-11** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Stanforth et al.** (U.S. Patent # 7,151,769 B2) in view of **Cain** (U.S. Patent # 6,961,310 B2).

Cain describes a timer used to indicate when the route expires.

> Ranking the discovered routes preferably includes storing route entries in a route cache or table. Each of the route entries corresponds to one of the discovered routes. Also, each,route entry may include a metric value, a usage factor indicating how much of the message data should be distributed to the corresponding route, and a timer for expiring the discovered route. Some or all of the route entries may be repeated for different classes of message data/traffic, such as, delay sensitive traffic and/or large volume traffic, for example.

The timer as described above and the claimed timer operated quire differently. First the timer has nothing to do with when the route was first discovered. The timer can be set to some arbitrary value, e.g. 1 hour, which has nothing to do with the discovery time. Second, the time can be set at any time, before or after the route is discovered, so the time does not reveal the discovery time. Third, with a timer as described above, the route expires when the timer runs out. The nodes have no control over route expiration. In contrast, with the claimed time of route discovery, the route has no automatic expiration time. Nodes can decide themselves whether or not to use the route.

In addition, claimed is associating a time of discovery with each route, and

selecting the particular route having a most recent time of discovery, and including a time stamp indicating the time that the particular route was discovered in the routing table in each packet. Cain does not describe the selecting and including steps for his timer.

Cain does not describe using ad-hoc on-demand distance vector routing, and including the routing table in each transmitted packet.

For claims 11 and 12, see the traversal of claim 1 above.

With respect to claim 13, see above.

With respect to claim 14, the Examiner cites columns 6 and 8.

> destination-terminal. Adjacent or proximate terminals 10 exchange routing tables, as seen in FIG. 3, whereby, when a call is to be set up from a source-terminal, each terminal 10 already knows the routing table of its most immediate or adjacent neighbor-terminal, whereby a call may be routed to another destination-terminal, or to a router or gateway 20, for subsequent transmittal of the call to another similar cell of terminals, to a cellular switched network, or to the PSTN, and the like.

> upgrade to the routing table will ensue. The updated routing table will be transmitted to each adjacent terminal of the ad-hoc, peer-peer-radio system, preferably as part of the configuration data time-frame messaging transmitted and received on the control channel, as disclosed in commonly-owned U.S. application No. 60/246,833 and U.S. Pat. No.

Neither paragraph describes updating the routing table in the packet each time a packet is transmitted. In fact, Stanford only updates *periodically*, see

"Referring now to FIGS. 4 7, there are shown the flow charts for the method of adding battery-status information to the routing tables of the terminals 10. Each terminal periodically wakes up in order to check its own battery status (FIG. 4A 0 Blocks 30, 32), after which it will update, if necessary, it routing table (FIG. 5). If the status remains unchanged, then the status of the battery of that terminal will remain unchanged, or stable, as shown in FIG. 4B (block 36), and no change will be made to that terminal's routing table. Again, periodically, the terminal will self-test its battery life (block 38). The battery status is checked using the subroutine "Evaluation" (blocks 34 and 40 in FIGS. 4A and 4B, respectfully)."

It is believed that this application is now in condition for allowance. A notice to this effect is respectfully requested. Should further questions arise concerning this application, the Examiner is invited to call Applicants' attorney at the number listed below. Please charge any shortage in fees due in connection with the filing of this paper to Deposit Account 50-0749.

Respectfully submitted,
Mitsubishi Electric Research Laboratories, Inc.

By

/Dirk Brinkman/

Dirk Brinkman
Attorney for the Assignee
Reg. No. 35,460

201 Broadway, 8th Floor
Cambridge, MA 02139
Telephone: (617) 621-7539
Customer No. 022199